

Remarks

The Final Office Action dated December 11, 2009 lists the following new grounds of rejection: claims 6-7, 10-14, 17 and 20-24 stand rejected under 35 U.S.C. § 103(a) over Rhee (U.S. Patent No. 6,667,525) in view of Suguro (U.S. Patent Pub. 2001/0039107 and further in view of Tao (U.S. Patent No. 6,399,515); claims 8 and 18-19 stand rejected under 35 U.S.C. § 103(a) over the ‘525, ‘107 and ‘515 references in view of Holloway (U.S. Patent No. 6,222,251); and claim 9 stands rejected under 35 U.S.C. § 103(a) over the ‘525, ‘107 and ‘515 references in view of Gardner (U.S. Patent No. 6,160,300). Applicant traverses all of the rejections and, unless explicitly stated by the Applicant, does not acquiesce to any objection, rejection or averment made in the Office Action.

Applicants request that the finality of the subject Office Action be withdrawn because the Office Action asserts a new ground of rejection based upon the new ‘251 reference. Applicant submits that no amendment has been made in the previous responses to necessitate the rejection. Accordingly, the finality of the Office Action is improper under M.P.E.P § 706.07(a).

Applicant respectfully traverses the § 103(a) rejection of claims 6-14 and 17-24 because the Examiner fails to provide a valid reason for the proposed combination of the asserted references. Consistent with M.P.E.P. § 2143.01 and relevant case law, a § 103 rejection must provide evidence of motivation where a proposed combination of references would modify a primary reference. *See, e.g., KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (U.S. 2007) (“A patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art.”). In this instance, the Examiner proposes to combine the grain sizes of metal gate electrode 3 of the ‘107 reference with the semiconductor gate layers 23 and 24 of the ‘525 reference “to reduce the variations in threshold voltage.” However, as discussed below, metallic and polysilicon materials exhibit different semiconductor properties that cannot be combined as proposed without extensive modification, beyond that taught in the asserted references. In light of these differences, the proposed combination lacks any supporting evidence, and further does not provide a clearly-articulated reason (or

explanation as to how the ‘525 reference could or would operate as modified), that would be consistent with the *KSR* decision. Accordingly, the § 103(a) rejection is improper for lack of motivation and Applicant requests that it be withdrawn.

Specifically, the Office Action does not provide any support or reasoning for the conclusion that grain size of polysilicon will exhibit semiconductor properties expected as grain sizes used in connection with metallic compounds. Applicant asserts that the teaching of grain sizes in the ‘107 reference is inextricably linked to the metallic gate material used. The rejection ignores differences in the physical properties of silicon and metal semiconductor material known in the art. For example, as discussed in the ‘107 reference, metal gate electrodes have reduced resistance (*see* paragraph 0017), and replacing polysilicon gate electrodes with metalized gate electrodes introduces several problems such as an undesirable work function because “metal gate electrodes have a property that the work function of a metal varies as their material varies with crystal orientations.” *See, e.g.*, paragraph 0078. Because of these differences, extensive modification to the cited teachings of the ‘525 and ‘107 references would be required to overcome various problems associated with metallic gates as discussed above. In view of the above, adequate support for the proposed combination has not been presented and Applicant requests the §103 rejections be withdrawn.

Applicant further traverses the § 103(a) rejection of claim 9 because the ‘525 reference teaches away from a final gate structure having an amorphous silicon upper gate. Consistent with the above-cited *KSR* decision, M.P.E.P. § 2143.01 explains the long-standing principle that a § 103 rejection cannot be maintained when the asserted modification undermines either the operation or the purpose of the main (‘525) reference - the rationale being that the prior art teaches away from such a modification. *See KSR* at 1742 (“[W]hen the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be non-obvious.”).

The intended purpose of the ‘525 reference is to restrain the diffusion of Ge through the grain boundary from the lower layer 23 to the upper layer 24 by giving the lower layer 23 a columnar crystalline structure and the upper layer 24 random crystalline structure. *See, e.g.*, Col. 4:50 to Col. 5:22 and Figure 3. Applicant submits that replacing the ‘525 reference’s random crystalline structure upper layer 24 with a layer of

amorphous silicon would render the ‘525 reference unsatisfactory for restraining the diffusion of Ge through the grain boundary. As explicitly described in the description of the formation of the structure in cited Figure 3, if the upper layer is intermediately formed from amorphous silicon during manufacture (as proposed), “the amorphous Si layer is [then] crystallized to have a random polycrystalline structure . . . [c]onsequently, the formed gate structure is the same as that shown in Figure 3.” *See, e.g.*, Col. 5:41-44. As such, the ‘525 reference teaches away from the proposed structure and there is no motivation for the skilled artisan to modify the ‘525 reference in the manner proposed by the Examiner. Accordingly, the § 103(a) rejection of claim 9 is improper for lack of motivation and Applicant requests that it be withdrawn.

Applicant further traverses the § 103(a) rejection of claims 8, 18 and 19 because the cited combination of references lacks correspondence. For example, none of the asserted references teaches the claimed invention “as a whole” (§ 103(a)) including, *e.g.*, aspects of the claimed invention directed to a doping implant in the activated gate material having the specified abruptness of doping. The Examiner acknowledges that the ‘515 and ‘525 references fail to disclose these aspects. The addition of the ‘251 reference fails to cure these defects. Applicant submits the relationship between the doping profile and the resulting depletion region is not a result affecting parameter as asserted in the Office Action. In order to be a result effective variable, a parameter must be adjustable in a workable range through routine experimentation to achieve a recognized result.

M.P.E.P. § 2144.05(II)(B). In contrast, the claimed abruptness of the doping level is not a result effective variable because it was not achievable through routine experimentation using methods of semiconductor construction known in the prior art. This premature conclusion ignores the well known problem of the penetration of dopants from the gate into the gate insulator and channel regions during implantation and dopant activation, which results in decreased performance. This problem is discussed throughout Applicant’s published application. Applicant directs Examiner’s attention to Col. 2:5-11 of the ‘525 reference and paragraphs 0022-0026 of the ‘107 reference for further discussion of the problem of dopant penetration. Applicant submits that the Office Action does not provide support for the conclusion that the claimed abruptness of the doping profile is an obvious optimization of a result affective variable. Accordingly, the

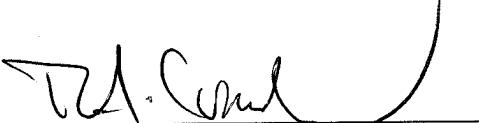
§ 103(a) rejection of claims 8, 18 and 19 is improper and Applicant requests that it be withdrawn.

For the purpose of clarity, Applicant has amended claims 8, 18, and 19 to reflect the original intent of the claims. Support for these amendments can be found at paragraph 0048 of Applicant's published Application. In view of the remarks above, Applicant believes that each of the rejections has been overcome and the application is in condition for allowance. Should there be any remaining issues that could be readily addressed over the telephone, the Examiner is asked to contact the agent overseeing the application file, Peter Zawilski, of NXP Corporation at (408) 474-9063 (or the undersigned).

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